# APPENDIX B

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## FACSIMILE TRANSMISSION



**TO:** Examiner Adolf Berhane, Art Unit 2838

**FAX:** 703-872-9306 **TELEPHONE:** 703-308-3299

**FROM:** Alfred K. Wiedmann Jr., PTO Reg. No. 48,033

**DATE:** October 27, 2003

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## LETTER OF FACSIMILE TRANSMITTAL

| | |
|---|---|
| First Named Inventor: | Robert M. Porter |
| Serial Number: | 10/030,379 |
| Filed: | January 2, 2002 |
| For: | Multiple Element Rectification Circuit |
| Assignee: | Advanced Energy Industries, Inc |
| Attorney Docket No.: | AEI VRM USNP1 |

Enclosed for filing in the above application please find the following:

1. a Second Preliminary Amendment (12 pages);
2. a Credit Card Payment Form authorized in the amount of $722.00 for the additional claim fees (1 page),
3. this Letter of Transmittal (2 pages); and
4. a Certificate of Facsimile Transmittal (1 page).

**Please confirm receipt of the documents by return facsimile indicating the date of receipt and application number.**

I have this 27th day of October, 2003, either myself personally or through my direction of staff at this office, forwarded all of the items in the above Letter of Transmittal via Facsimile Number 703-872-9306, Attention: Examiner Adolf Berhane, Art Unit 2838.

Dated this 27th day of October, 2003.

Respectfully Submitted,
SANTANGELO LAW OFFICES, P.C.

By: _____

Alfred K. Wiedmann Jr.
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Facsimle Number 703-872-9306
Attorney Docket: AEI VRM USNP1

IN THE UNITED STATES PATENT
AND TRADEMARK OFFICE

| | |
|---|---|
| In Re the Application of: | Robert M. Porter, Anatoli V. Ledenev, and Gennady G. Gurov |
| Serial Number: | 10/030,379 |
| PCT No.: | PCT/US00/18086 |
| Filed: | January 2, 2002 |
| International Filing Date: | June 30, 2000 |
| Priority Date: | July 2, 1999 |
| For: | Multiple Element Rectification Circuit |
| Assignee: | Advanced Energy Industries, Inc. |

# SECOND PRELIMINARY AMENDMENT

## I. INTRODUCTORY REMARKS

The Assignee submits this Second Preliminary Amendment to add certain claims previously cancelled in a first preliminary amendment filed upon entry into the US national phase.

The Assignee notes that each of the claims remaining in this case satisfies the criteria of PCT Article 33(1)-(4) as to novelty, inventive step and industrial applicability.

**Amendments to the Claims** are reflected in the listing of claims beginning on separate page 2 of this paper;

**Remarks** begin on page 11 of this paper.

## II. AMENDMENTS TO THE CLAIMS

The following listing of claims should be entered to replace all prior listing of claims in the application. In accordance with Rule 121, the status of each claim is indicated parenthetically.

**Listing of Claims:**

Claims 1-253 (canceled)

254. (original) A rectification circuit comprising:
   a. a first rectifier element;
   b. a second rectifier element;
   c. an overlapping conduction rectifier control system to which said first and said second rectifier elements are responsive; and
   d. a DC output responsive to said first rectifier element and said second rectifier element.

255. (original) A rectification circuit as described in claim 254 wherein said overlapping conduction rectifier control system to which said first and said second rectifier elements are responsive causes conduction in both said first rectifier element and said second rectifier element to simultaneously occur at least some time.

256. (original) A rectification circuit as described in claim 254 wherein said first rectifier element comprises a first switched rectifier element and wherein said second rectifier element comprises a second switched rectifier element.

257. (original) A rectification circuit as described in claim 254 wherein said first rectifier element comprises a first controllable diode element and wherein said second rectifier element comprises a second controllable diode element.

258. (original) A rectification circuit as described in claim 254 wherein said overlapping conduction rectifier control system to which said first and said second rectifier elements are responsive comprises an overlapping conduction rectifier control system configured to create a conduction angle in each of said first and said second rectifier elements selected from a group consisting of at least about 180 degrees, at least about 300 degrees, a conduction angle which creates a low rectifier RMS current, a conduction angle which creates a rectifier RMS current which is low as compared to an output current, a conduction angle which creates a rectifier RMS current which less than about 1.3 as compared to a DC output current, a conduction angle which creates a rectifier RMS current which less than about 1.4 as compared to a DC output current, a conduction angle which creates a rectifier RMS current which is less than about 1.5 as compared to a DC output current, and a conduction angle which creates zero voltage on each said rectifier at the time when said rectifier is switched to a conductive state.

259. (original) A rectification circuit as described in claim 254 or 258 wherein said rectification circuit further comprises high voltage response circuitry which subjects said first and said second rectifier elements to a high voltage when said first and said second rectifier elements are in a non-conducting state.

260. (original) A rectification circuit as described in claim 259 wherein said high voltage response circuitry subjects said first and said second rectifier elements to a voltage selected from a group consisting of at least about 1.4 times a DC output voltage, at least about 8 times a DC output voltage, at least about 15 volts, and at least about 20 volts.

261. (original) A rectification circuit as described in claim 254 and further comprising a transformer element to which said first and said second rectifier elements are responsive.

262. (original) A rectification circuit as described in claim 261 and further comprising a total capacitance and a transformer leakage inductance and wherein said overlapping conduction rectifier control system to which said first and said second rectifier elements are responsive comprises an overlapping conduction rectifier control system configured

to create a conduction angle in each of said first and said second rectifier elements, wherein said conduction angles and said total capacitance are coordinated with said transformer leakage inductance.

263. (original) A rectification circuit as described in claim 262 wherein said first rectifier element comprises a first switched rectifier element and wherein said second rectifier element comprises a second switched rectifier element such that said conduction angles and said total capacitance are coordinated with said transformer leakage inductance to create zero voltage on each said switched rectifier element at the time when each said rectifier is switched to a conductive state.

264. (original) A rectification circuit as described in claim 261 and further comprising a transformer leakage inductance, wherein said rectification circuit affirmatively utilizes said transformer leakage inductance as an energy storage element.

265. (original) A rectification circuit as described in claim 264 and further comprising a total capacitance and wherein said overlapping conduction rectifier control system to which said first and said second rectifier elements are responsive comprises an overlapping conduction rectifier control system configured to create a conduction angle in each of said first and said second rectifier elements, wherein said conduction angles and said total capacitance are coordinated with said transformer leakage inductance.

266. (original) A rectification circuit as described in claim 265 wherein said first rectifier element comprises a first switched rectifier element and wherein said second rectifier element comprises a second switched rectifier element such that said conduction angles and said total capacitance are coordinated with said transformer leakage inductance to create zero voltage on each said switched rectifier element at the time when each said rectifier is switched to a conductive state.

Claims 267-327 (cancelled)

328. (original) A rectification circuit comprising:

a. a first rectifier element;

b. a second rectifier element;

c. a passive sinusoidal drive system to which said first rectifier element and said second rectifier element are responsive; and

d. a DC output responsive to said first rectifier element and said second rectifier element.

329. (original) A rectification circuit as described in claim 328 and further comprising a synchronous rectifier control system to which said first and second rectifier elements are responsive.

330. (original) A rectification circuit as described in claim 328 wherein said passive sinusoidal drive system comprises a gate drive transformer element.

331. (original) A rectification circuit as described in claim 328 wherein said sinusoidal drive system to which said first and second rectifier elements are responsive comprises a high frequency sinusoidal drive system.

332. (original) A rectification circuit as described in claim 331 wherein said high frequency sinusoidal drive system comprises a drive system operating at a frequency selected from a group consisting of a frequency greater than at least about 300 kHz, a frequency greater than at least about 500 kHz, a frequency greater than at least about 1 MHZ, a frequency greater than at least about 3 MHZ, a frequency greater than at least about 10 MHZ, a frequency greater than at least about 30 MHZ, a frequency coordinated with an inherent capacitance of said first and second synchronous rectifier elements, and any permutations or combinations of the above.

333. (original) A rectification circuit as described in claim 329 wherein said synchronous rectifier control system comprises a bias input.

334. (original) A rectification circuit as described in claim 333 wherein said bias input comprises a DC input.

335. (original) A rectification circuit as described in claim 333 wherein said bias input comprises a low frequency input.

336. (original) A rectification circuit as described in claim 334 wherein each of said first and second synchronous rectifier elements comprise a conduction angle responsive to said DC input.

337. (original) A rectification circuit as described in claim 335 wherein each of said first and second synchronous rectifier elements comprise a conduction angle responsive to said low frequency input.

Claims 338-357 (cancelled)

358. (new) A method of current rectification, comprising the steps of:

a. providing a first rectifier element and a second rectifier element;

b. providing an AC input to said first and second rectifier elements;

c. controlling overlapping conduction of said first and said second rectifier elements; and

d. producing a DC output.

359. (new) A method of current rectification, comprising the steps of:

a. providing a first rectifier synchronous element and a second synchronous rectifier element;

b. providing an AC input to said first and second synchronous rectifier elements;

c. passively sinusoidally driving said first and said second synchronous rectifier elements; and

d. producing a DC output.

360. (new) An AC to DC conversion system comprising:

a. an AC input;

b. a rectification circuit having a total capacitance; and

c. a DC output;

wherein said conversion system affirmatively utilizes said total capacitance of said rectification circuit.

361. (new) An AC to DC conversion system as described in claim 360 wherein said rectification circuit comprises at least two rectifier elements.

362. (new) An AC to DC conversion system as described in claim 361 wherein said at least two rectifier elements each comprise a Field Effect Transistor.

363. (new) An AC to DC conversion system as described in claim 362 wherein said total capacitance of said rectification circuit comprises an adjunct drain-to-source capacitance of each Field Effect Transistor.

364. (new) An AC to DC conversion system as described in claim 363 wherein said total capacitance of said rectification circuit further comprises circuit capacitance additional to said adjunct drain to source capacitance of each Field Effect Transistor.

365. (new) An AC to DC conversion system as described in claim 361 wherein said at least two rectifier elements each comprise a synchronous rectifier element.

366. (new) An AC to DC conversion system as described in claim 365 wherein said total capacitance of said rectification circuit comprises an adjunct capacitance of each synchronous rectifier element.

367. (new) An AC to DC conversion system as described in claim 366 wherein said total capacitance of said rectification circuit further comprises circuit capacitance additional to said adjunct capacitance of each synchronous rectifier element.

368. (new) An AC to DC conversion system as described in claim 366 wherein said conversion system affirmatively utilizes said adjunct capacitance of each said synchronous rectifier element to create zero voltage on each said synchronous rectifier element prior to a switched conductive state of each said synchronous rectifier element.

369. (new) An AC to DC conversion system as described in claim 365 wherein said conversion system operates at a power conversion frequency and wherein said conversion system affirmatively utilizes said power conversion frequency to create zero voltage on each said synchronous rectifier element prior to a switched conductive state of each said synchronous rectifier element.

370. (new) An AC to DC conversion system as described in claim 369 wherein said conversion system operates at a frequency selected from a group consisting of a frequency greater than at least about 300 kHz, a frequency greater than at least about 500 kHz, a frequency greater than at least about 1 MHZ, a frequency greater than at least about 3 MHZ, a frequency greater than at least about 10 MHZ, a frequency greater than at least about 30 MHZ.

371. (new) An AC to DC conversion system as described in claim 365 and further comprising an overlapping conduction rectifier control system and wherein said conversion system affirmatively utilizes a conduction angle of each said synchronous rectifier element to create zero voltage on each said synchronous rectifier element prior to a switched conductive state of each said synchronous rectifier element.

372. (new) An AC to DC conversion system as described in claim 371 wherein said conduction angle of each of said at least two rectifier elements is selected from a group consisting of at least about 180 degrees, at least about 300 degrees, a conduction angle which creates a low rectifier RMS current, a conduction angle which creates a rectifier RMS current which is low as compared to an output current, a conduction angle which creates a rectifier RMS current which less than about 1.3 as compared to a DC output

current, a conduction angle which creates a rectifier RMS current which less than about 1.4 as compared to a DC output current, and a conduction angle which creates a rectifier RMS current which is less than about 1.5 as compared to a DC output current.

373. (new) An AC to DC conversion system as described in claim 365 and further comprising a transformer element and wherein said conversion system affirmatively utilizes a transformer leakage inductance of said transformer element to create zero voltage on each said synchronous rectifier element prior to a switched conductive state of each said synchronous rectifier element.

374. (new) An AC to DC conversion system as described in claim 365 wherein said coversion system affirmatively coordinates a power conversion frequency of said conversion system, a conduction angle of each said synchronous rectifier element, a transformer leakage inductance of said conversion system, and said total capacitance to create zero voltage on each said synchronous rectifier element prior to a switched conductive state of each said synchronous rectifier element.

375. (new) An AC to DC conversion system as described in claim 360 wherein said DC output powers a low voltage, high current component operating at a nominal DC voltage selected from a group consisting of less than about 2 volts, less than about 1.8 volts, less than about 1.5 volts, less than about 1.3 volts, less than about 1 volt, and less than about 0.4 volts.

376. (new) An AC to DC conversion system as described in claim 360 wherein said DC output powers a low voltage, high current component capable of a rapid current demand which rises at a level selected from a group consisting of at least about 0.2 amperes per nanosecond, at least about 0.5 amperes per nanosecond, at least about 1 ampere per nanosecond, at least about 3 amperes per nanosecond, at least about 10 amperes per nanosecond, and at least about 30 amperes per nanosecond.

377. (new) An AC to DC conversion system as described in claim 360 wherein said DC output powers a low voltage, high current component operating at a maximum current selected from a group consisting of more than about 15 amperes, more than about 20 amperes, more than about 50 amperes, and more than about 100 amperes.

378. (new) A method of AC to DC conversion, comprising the steps of:

a. providing a rectification circuit having a total capacitance;

b. providing an AC input to said rectification circuit;

c. affirmatively utilizing said total capacitance of said rectification circuit; and

d. producing a DC output.

## III. REMARKS

The Assignee has amended the application to add new claims 358-378, and indicates that new claim 358 is claim originally presented (but cancelled in a first preliminary amendment) claim 267 and new claims 359-378 are originally presented (but cancelled in a first preliminary amendment) claims 338-357, each of these claims determined in the international stage to satisfy the criteria of PCT Article 33(1)-(4) as to novelty, inventive step and industrial applicability. Assignee also notes that each of these claims are of Group III of the restriction groupings advanced by Examiner Berhane in a restriction mailed October 6, 2003, and who at the time of advancing such restriction, was apparently unaware of a first preliminary amendment in which claims 1-253, and 267-327 were cancelled without prejudice. During a telephone conference between Examiner Adolph Berhane and Assignee's representative, Al Wiedmann Jr. on October 27, 2003, Mr. Wiedmann pointed out said claim cancellations to Examiner Berhane and Examiner Berhane indicated in response that, as all claims pending in the case after the first preliminary amendment were included in one of the Examiner's claim groupings (Group III), it was not necessary for the Assignee to reply to the restriction requirement. Assignee's understanding in this regard is that the Examiner withdrew the restriction requirement upon being made aware of the fact that, at the time he issued the restriction requirement, the only claims remaining in the case were included in one of claim groupings set forth in the restriction. If the Assignee's understanding in this regard is incorrect, Assignee requests that the Examiner contact the Assignee's representative signing below as soon as possible.

The Assignee thanks the Examiner for his willingness to add the new claims to the case, as he also indicated during said telephone conference.

Assignee also indicates that it has paid a supplemental claim fee at a large entity basis for the claims added to the case – 21 total claims and 4 independent claims.

## CONCLUSION

Claims 254-266, 328-337, and 358-378 remain in the case. The Assignee submits that all claims remaining in the case are in condition for allowance and requests an allowance of said claims at the Examiner's earliest convenience.

Dated this 27th day of October, 2003.

Respectfully Submitted,

SANTANGELO Law Offices, P.C.

Alfred K. Wiedmann Jr.
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125 South Howes, Third Floor
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(970) 224-3100

Facsimile Number: 703-872-9306
Attorney Docket: AEI VRM USNP1

IN THE UNITED STATES PATENT
AND TRADEMARK OFFICE

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| Serial Number: | 10/030,379 |
| PCT No.: | PCT/US00/18086 |
| Filed: | January 2, 2002 |
| International Filing Date: | June 30, 2000 |
| Priority Date: | July 2, 1999 |
| For: | Multiple Element Rectification Circuit |
| Assignee: | Advanced Energy Industries, Inc. |

## CERTIFICATE OF FACSIMILE TRANSMISSION

I, Cheryl A. Swanson, hereby certify to the truth of the following items:

1. I am an employee of Santangelo Law Offices, P.C., 125 South Howes, Third Floor, Fort Collins, Colorado 80521.

2. I have this day forwarded the foregoing Letter of Facsimile Transmission; a Second Preliminary Amendment, a Credit Card Payment Form authorized in the amount of $722.00 for the additional claim fees, and this Certificate of Facsimile Transmission via facsimile number 703-872-9306, addressed to: Examiner Adolf Berhane, Art Unit 2838.

Dated this 14th day of October, 2003.

Cheryl A. Swanson

TO:Auto-reply fax to 9702243175 COMPANY:

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**FAX:** 703-872-9306 **TELEPHONE:** 703-308-3299

**FROM:** Alfred K. Wiedmann Jr., PTO Reg. No. 48,033

**DATE:** October 27, 2003

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**LETTER OF FACSIMILE TRANSMITTAL**

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